CREATING A NEW WORLD WITH ELECTRONICS

HUGHES

HUGHES AIRCRAFT COMPANY

VACUUM TUBE PRODUCTS DIVISION

MODEL VTA - 60 MINIATURE WELD HEAD
MODEL VTA - 61 AIR ACTUATED WELD HEAD
MODEL VTA - 64 SERIES WELDING HEAD

INSTRUCTION MANUAL

HUGHES AIRCRAFT COMPANY
VACUUM TUBE PRODUCTS DIVISION
2020 OCEANSIDE BLVD., OCEANSIDE, CALIF. 92054
TELEPHONE: AREA CODE 714, 722-2101 TWX: 910 322-1380

OPERATION AND MAINTENANCE MANUAL

MODELS
VTA-60 - VTA-61 - VTA-64
WELD HEADS

PREPARED BY

HUGHES AIRCRAFT COMPANY
VACUUM TUBE PRODUCTS DIVISION
OCEANSIDE, CALIFORNIA

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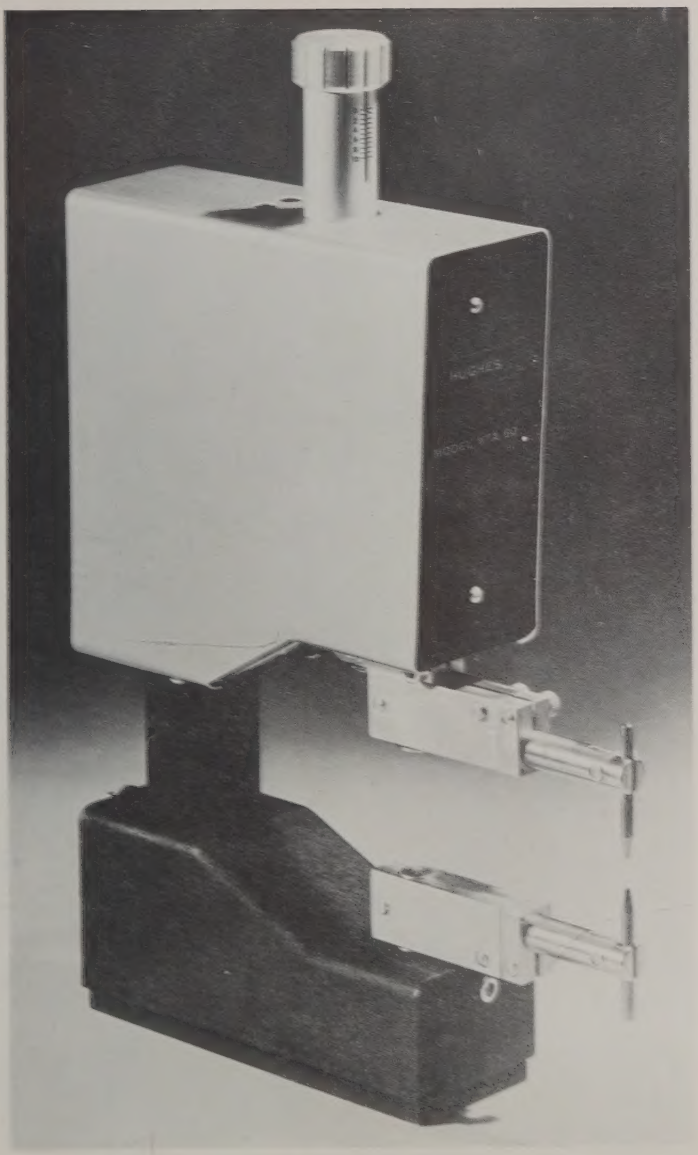


Fig. 1 - 1

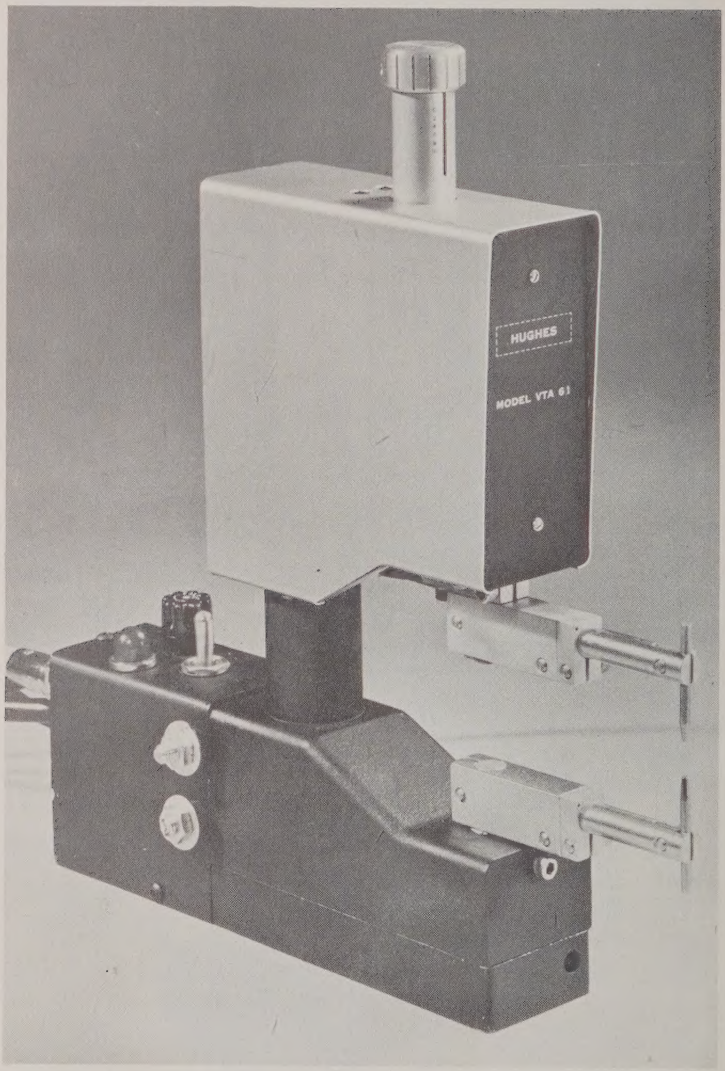


Fig. 1 - 2

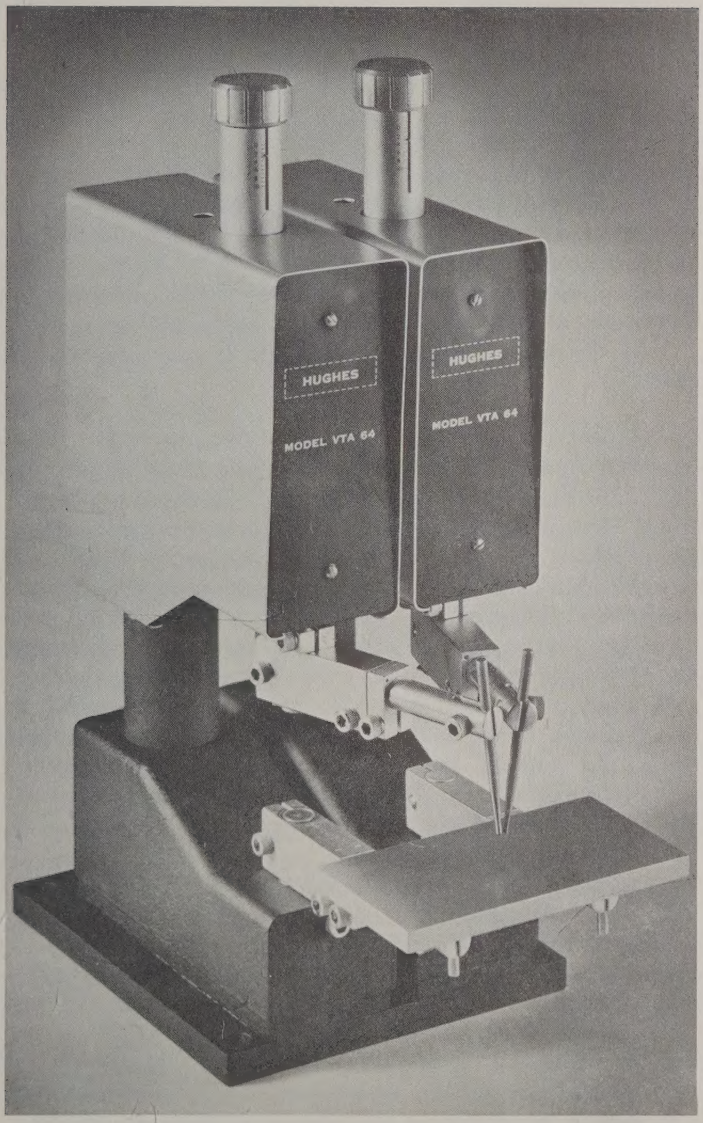


Fig. 1 - 3

SECTION I, GENERAL DESCRIPTION

IDENTIFICATION.

This publication comprises operating and maintenance instructions covering the Module Weld Head, VTA-60, Air Operated Module Weld Head, VTA-61, and Series Module Weld Head, VTA-64, manufactured by the Vacuum Tube Products Division, Hughes Aircraft Company, Oceanside, California.

PURPOSE.

The Module Weld Head, VTA-60, figure 1-1, provides complete miniature electronic welding capabilities for precision metal assembly. The Module Weld Head features universal adjustment permitting previously difficult welds to be performed easily. A precision graduated adjustment provides operator selection of varying degrees of weld force from several ounces to a number of pounds. The unit is provided with totally adjustable electrodes and gold plated electrode arms and arm holders. The Module Weld Head is rugged and conservatively designed and is capable of providing consistent welds, regardless of weld set-up configuration, and constant long term service.

The Air Operated Module Weld Head, VTA-61, figure 1-2, is basically the same instrument as the Module Weld Head, VTA-60, with the exception that this instrument has the additional feature of air-actuation. The use of this unit results in the reduction of operator activity to a minimum thereby allowing increased production scheduling. The Air Operated Module Weld Head is provided with an air speed control, a solenoid actuating valve, and a two position foot switch.

The Series Module Weld Head, VTA-64, figure 1-3, consists of two Module Weld Heads mounted on a common base plate and equipped with a table-type lower electrode. This unit is well suited for welding assemblies which are insulated or inaccessable on their underside. The slim design and mobility of the electrode arms enable operators to perform top surface welds which are normally difficult to obtain. The electrodes may be adjusted to within a fraction of an inch of each other with electrode angles as nearly vertical as possible thereby providing a series weld of maximum quality and reliability.

NOTE

The content of this instructional manual will be presented in terms of the Module Weld Head, VTA-60. Reference will be made to the Air Operated Module Weld Head, VTA-61, and the Series Module Weld Head, VTA-64, when necessary in order to indicate the differences existing between the instruments.

PHYSICAL DESCRIPTION.

The Module Weld Head, VTA-60, is self contained and consists of a rugged base assembly, frame assembly, electrode holder assemblies, and a foot pedal. The Air Operated Module Weld Head, VTA-61, consists of an air-actuator assembly, in addition to the above. The Series Module Weld Head, VTA-64, consists of two VTA-60's mounted side by side on a common base mount.

BASE ASSEMBLY. The Base Assembly consists of a cast aluminum base, a turned brass column, and a bonded phenolic sleeve. The aluminum base is copper plated for increased electrical

conductivity and finished in black enamel. A hole is provided in the front portion of the aluminum base for mounting the lower electrode holder assembly. This hole is provided with a keyway to insure adjustment in the vertical plane only. The phenolic sleeve is placed over the brass column, both of which are then pressed into the aluminum base. The phenolic sleeve provides complete insulation between the aluminum base and brass column.

FRAME ASSEMBLY. The Frame Assembly consists of a cast aluminum frame which is anodized for corrosion resistance. The top, and left and right sides of the Frame Assembly are enclosed in a sheet aluminum case which is gold anodized. The front side of the Frame Assembly is covered with a face plate. The following assemblies are mounted within the Frame Assembly:

a. The Pressure Barrel Assembly

b. The Actuating Cable Assembly

c. The Operating Lever Assembly

d. The Firing Switch Assembly

e. The Jumper Assembly

f. The Link Assembly

g. The Ram Assembly

h. The Yoke Assembly

AIR-ACTUATOR ASSEMBLY. The Air-Actuator Assembly consists of a cast aluminum base and sheet aluminum case which encloses the necessary pneumatic and electrical components. The design of the Air-Actuator Assembly is such as to permit flush

mounting to the base of a Module Weld Head, VTA-60. The cast aluminum base contains a flow valve, solenoid, and actuating piston assembly, while the sheet aluminum case contains a power switch, pilot lamp, and fuse holder. The base and case are finished in black enamel.

SPECIFICATIONS.

Specifications for the Module Weld Head, VTA-60, are contained in table 1-1.

Table 1-1. Specifications, Module Weld Head, VTA-60.

DIMENSIONS	
Height	11 Inches
Width	1-3/4 Inches
Depth	7 Inches
Throat Depth (normal)	5-1/4 Inches (distance between electrodes and main column)
Vertical Work Opening	1-3/8 Inches (distance between electrode tips)
WELD FORCE	8 ounces to 20 pounds, continuously adjustable
MAXIMUM POWER CAPACITY	150 watt-seconds
OPERATION MODE	Foot pedal, swing pedal
EQUIPMENT	Includes the VTA-60 Module Weld Head, one pair RWMA-2 electrodes, and two 9 inch weld cables

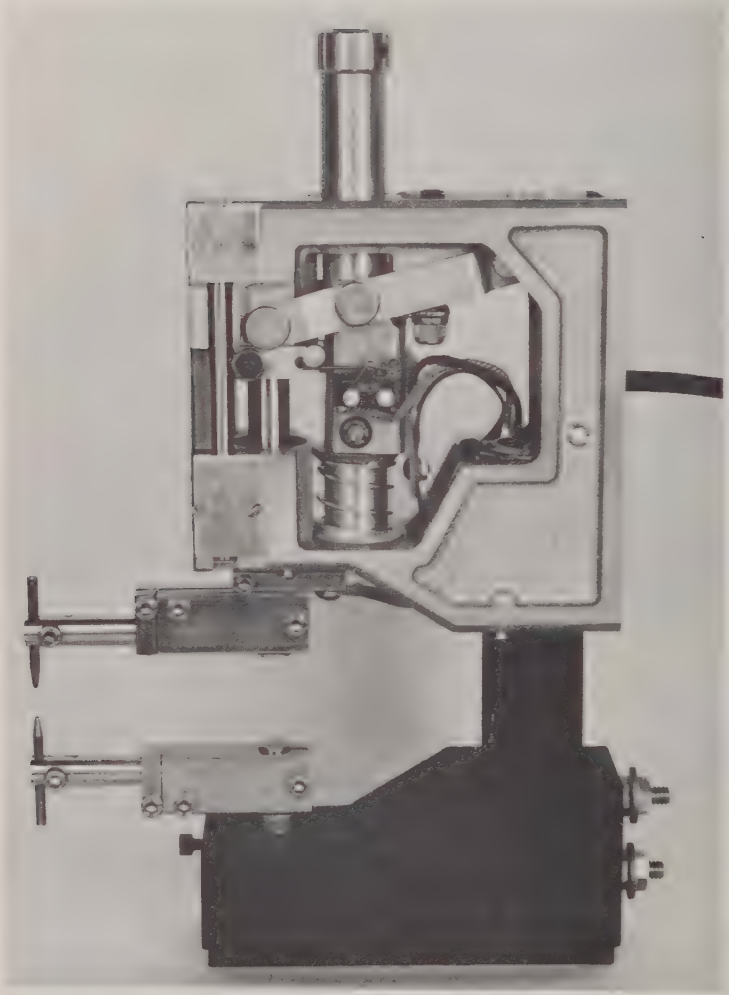


Fig. 2 - 1

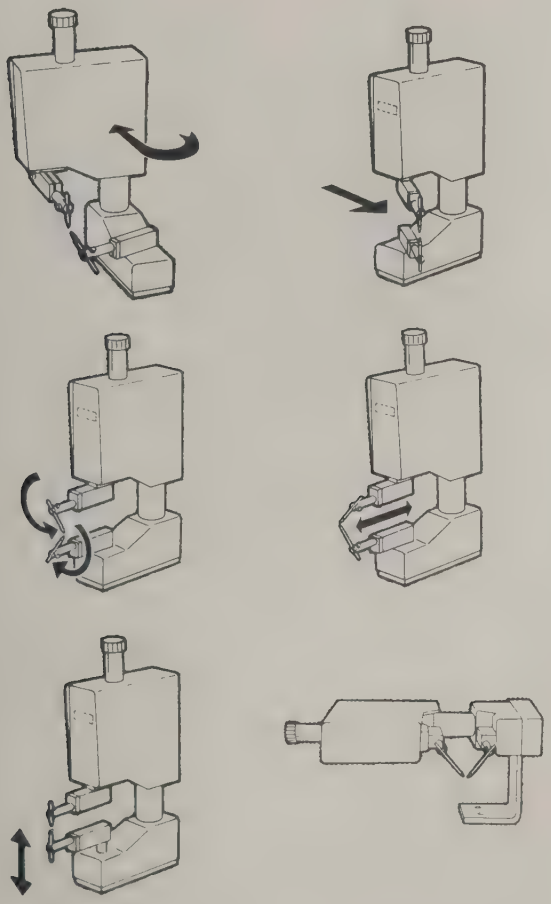


Fig. 2 - 2

SECTION II

OPERATING PROCEDURES

2-1. OPERATING CONTROLS AND INDICATORS.

2-2. Table 2-1 contains a tabulation of the functions of the various operating controls. (See figures 2-1, 4-1 and 4-3.) Figure 2-2 illustrates the extreme range of adjustments possible with the Module Weld Head, VTA-60.

Table 2-1. Operating Controls and Indicators

CONTROL OR INDICATOR	FUNCTION
FORCE Adjustment Knob (12)	Provides manual control of electrode force. Electrode force may be varied from 8 ounces to 20 pounds
UP STOP Adjustment Screw (13)	Provides manual adjustment of upper limit of Pressure Barrel Assembly travel.
DOWN STOP Adjustment Screw (14)	Provides manual adjustment of lower limit of Pressure Barrel Assembly travel.

HEAD, HORIZONTAL Adjustment Screws (24 and 28)	Provides clamping force to retain weld head in any horizontal position. The weld head may be rotated 360 degrees if desired.
ELECTRODE ARM HOLDER Swivel Screws (57 and 60)	Provides clamping force to retain the electrode holder assemblies in any horizontal position ranging to 180 degrees.
ELECTRODE ARM CLAMP Screws (62 and 72)	Provides clamping force to retain the electrode arms in any position extending to 6 inches. The horns may be rotated a full 360 degrees.
COLLAR Screws (64 and 71)	Provides clamping force to retain the electrode arms to indexing collar. The collar indexer facilitates electrode repositioning to within $\pm$ 1 degree.
ELECTRODE HOLDER ASSEMBLY Adjustment Screw (63)	Provides clamping force to retain Electrode Holder Assembly and shaft in any vertical position up to 3/4 inch.

ELECTRODE ARM Screws (67 and 69)	Provides clamping force to retain electrodes within electrode arms.
PILOT LAMP (136) (mounted on base of Air Actuator Assembly of VTA-61) (See Figure 4-3.)	Provides visual indication that power has been applied to the Air Actuator Assembly of VTA-61.
HOLD-WELD/PRESSURE-SENSING Switch (143) (mounted on base of Air Actuator Assembly of VTA-61)	Provides manual selection of two operating modes. In the HOLD-WELD position, the clamping force is applied to the weld junction with the foot switch at the first position. To make a weld, the foot switch must be depressed to the second position. In the PRESSURE-SENSING position, the clamping force and weld are simultaneous when the foot switch is depressed to the first position.

2-3. PREPARATION FOR USE.

2-4. The Module Weld Head, VTA-60, is prepared for use as follows:

a. Drill mounting holes in workbench according to hole template provided with the weld head. Position of head to edge of workbench is arbitrary and is determined by the intended application.

b. Mount weld head, not supplied with Universal Mounting Brackets, to the workbench using three 1/4-20 hold-down bolts which are supplied with the instrument.

CAUTION

The 1/4-20 hold-down bolts supplied with the instrument are 5/8 inch in length and permit mounting the weld to workbenches which are 1/4 inch or less in thickness. In the event it is desired to mount the weld head to workbenches having a thickness greater than 1/4 inch, insure that the length of 1/4-20 hold-down bolts selected do not enter the Base Assembly more than 1/2 inch when tightened.

c. Mount the Universal Mounting Bracket, when supplied with the instrument, to the workbench using two 82 degree 5/16-18 flat-head screws which are supplied with the instrument.

d. Clean exposed shaft of pressure barrel (8) of all packing material, dirt, and lint prior to use. (See figure 4-1.)

NOTE

Use a clean, soft, lint-free cloth. It is not necessary or recommended that specialized cleaning solvents be used.

e. Place the foot pedal on the floor directly under the weld head and connect the chain to the foot pedal using the "S" hook provided with the instrument.

NOTE

Position the "S" hook on the chain so that the foot pedal is raised to allow approximately 2 inches of travel. The travel may be increased if desired, but must be at least 2 inches. Insure that the chain and cable are not rubbing against the hole within the workbench.

CAUTION

Use a backing wrench when tightening the nuts removed in the following step. Use extreme care not to over-torque the studs when the nuts are tightened.

f. Remove outer nuts (36 and 40) and flat washers (37 and 41) from each of the two terminal studs (39 and 43) located on the rear of the base assembly.

g. Install one power cable on each terminal stud.

h. Replace washers and nuts, then tighten nuts to prevent arcing and loss of power.

i. For usual polarity connections, connect the upper electrode power cable to the positive receptacle of the power supply.

NOTE

To install power cables to Hughes power supplies, hold power cable camlock fitting flat side up and insert camlock into the proper receptacle on the power supply. Turn 1/4 turn clockwise to secure the camlock.

WARNING

Insure that the Frame Assembly is completely enclosed prior to connecting the actuator cable (46). Check to see that the power supply is OFF. When the actuator cable (46) is installed, the equipment is operative and there is a possibility of shock from terminals of the actuator switch.

j. Install the switch-cord connector (31) in the female receptacle of the power supply and tighten the ring nut to secure the connection.

2-5. The Air Operated Module Weld Head, VTA-61, is prepared for use as follows:

CAUTION

Insure that the air supply is turned OFF prior to performing the following procedures.

a. Connect the weld head switch-cord to receptacle (38) on the air actuator.

b. Connect the switch-cord (168) from the air actuator to the appropriate receptacle on the power supply. (See figure 4-3.)

c. Connect the four prong plug from the foot switch to receptacle (144) on the air actuator.

CAUTION

It is recommended that an air line lubricator be inserted at the air source input of the Air Actuator Assembly. It is also necessary that the air source be adequately filtered to protect the precision components from foreign particle damage.

d. Connect air line to the air line input connector (145).

e. Connect polarized power cable (169) to appropriate source.

2-6. OPERATING PROCEDURES.

2-7. The Module Weld Head, VTA-60, is operated as follows:

NOTE

Insure that the OPERATION SWITCH, located on the Stored Energy Power Supply is at SET-UP, and the AC POWER SWITCH is at OFF.

a. Loosen the two 9/64 inch HEAD, HORIZONTAL Adjustment Screws (24 and 28) securing the weld

head to the column and rotate the weld head to desired position. (See figures 2-2 and 4-1.)

b. Tighten both HEAD, HORIZONTAL Adjustment Screws (24 and 28) to secure the weld head.

NOTE

The weld head may be horizontally rotated 360 degrees should it be necessary or desired. Insure that the head is properly secured upon repositioning.

c. Loosen the ELECTRODE ARM Screws (67 and 69), the COLLAR Screws (64 and 71), the ELECTRODE ARM CLAMP Screws (62 and 72), and ELECTRODE ARM HOLDER SWIVEL Screws (57 and 60) on both the upper and lower Electrode Holder Assemblies.

d. Remove the electrodes from the electrode arms (66 and 73) and shape in accordance with the Hughes Techniques for Resistance Welding.

CAUTION

Tighten the upper and lower ELECTRODE ARM Screws (67 and 69) as necessary to secure the electrodes when performing the following step. Overtightening the electrodes within the Electrode Holder Assemblies can cause distortion of the electrode arms.

e. Replace the electrodes within the upper and lower Electrode Holder Assemblies and secure by tightening the 8-32 ELECTRODE ARM Screws (67 and 69).

f. Swivel the upper and lower Electrode Holder Assemblies to desired position and tighten the ELECTRODE ARM HOLDER Swivel Screws (57 and 60) on both the upper and lower Electrode Holder Assemblies.

g. Position the electrode arms (66 and 73) within the locating collars (70 and 75) and clamp as desired, then tighten the ELECTRODE ARM CLAMP Screws (62 and 72) and COLLAR Screws (64 and 71) on both the upper and lower electrode horn assemblies.

h. Check upper and lower electrodes for alignment.

NOTE

Perform steps "a" through "g" as necessary to insure that the electrodes are properly aligned.

i. Set the electrode pressure, using the FORCE Adjustment Knob (12) located at the top of the weld head, until the indicator on the scale is at the desired pressure.

NOTE

Use Accessory Pressure Gage VTA-49 for precision electrode pressure setting.

j. Insert a 9/64 inch hex key through the right-hand hole located on the top side of the weld head, directly behind the pressure barrel, and adjust the DOWN STOP Adjustment Screw (14).

NOTE

The DOWN STOP Adjustment Screw (14) is

adjusted just beyond the firing point. Approximately 1/32 inch is required for full travel of the DOWN STOP. Do not adjust the DOWN STOP too closely in order that the Actuator Switch may operate freely.

k. Insert a 9/64 inch hex key through the left-hand hole located on the top side of the weld head, directly behind the pressure barrel, and adjust the UP STOP Adjustment screw (13) to desired limit.

l. Turn the power supply ON in accordance with the instructions supplied with the particular power supply being used.

NOTE

Allow one minute for power supply warm-up time.

m. Discharge the power supply several times with the weld heat control at minimum, then turn the control knob on the power supply to the desired watt-second setting.

n. Rest the materials to be welded on the lower electrode.

CAUTION

Never have the electrodes closed when operating the discharge switch on the power supply, or trip the actuator switch by bringing the electrodes together without materials between them. Damage to electrodes may result.

o. Bring the upper electrode into contact with the materials to be welded by pressing down on the foot pedal. In the event the materials are not in the desired position, release the foot pedal pressure slightly to realign the materials.

p. Continue to apply pressure on the foot pedal, after the materials are in the desired aligned position, until the power supply automatically fires when the preset force is reached.

NOTE

Ram assembly must travel approximately 1/32 inch, after the materials to be welded are contacted, before the Actuator Switch is closed and the power supply is discharged.

2-8. The Air Operated Module Weld Head, VTA-61, is operated as follows:

CAUTION

The air supply flow valve (155), controlled by a hex key fitting located at the lower right hand front of the Air Actuator Assembly, has been closed by factory technicians prior to shipment. Proceed with CAUTION when opening the air supply flow valve (155). Open the valve slowly and a little at a time to prevent damaging the VTA-61 from over-pressure. (See figure 4-3.)

a. Open and adjust the air supply flow valve (155) for desired speed of electrode travel.

NOTE

The DOWN STOP Adjustment on the VTA-61 weld head controls the lower limit of upper electrode travel.

b. Adjust the DOWN STOP Adjustment Screw (14) for proper travel without excessive over-travel, then set the air actuator HOLD-WELD/ PRESSURE-SENSING switch in the HOLD-WELD position.

c. Place the materials to be welded, or a gage of equal thickness, between the electrodes and depress the foot switch through the first position on to the second position.

NOTE

Adjustment of the DOWN STOP (14), when properly made, allows no more than approximately 5 ounces of over force.

2-9. Perform the following procedures to manually operate the Air Operated Module Weld Head, VTA-61.

NOTE

The use of the foot pedal is not required in order to set up the VTA-61. The instructions are included as a convenience to the operator.

NOTE

A NO. 8-32 eyebolt is supplied with the VTA-61 which upon use provides connection of the foot pedal chain to the main column (164) of the Air Actuator Assembly.

The main column (164) is accessible through a hole within the center of the base (146).

a. Connect the weld head switch cord (23) to the appropriate power supply receptacle.

b. Attach the NO. 8-32 eyebolt to the main column (164) of the Air Actuator Assembly which is accessible through a hole within the center of the base (146).

c. Attach the foot pedal chain to the eyebolt.

d. Adjust the chain length for sufficient pedal movement to provide adequate upper electrode travel.

e. Adjust the electrode position so that the upper electrode meets the lower electrode when the foot pedal is depressed. To weld, the foot pedal must be depressed until the firing switch within the weld head is actuated.

NOTE

Clamping force is always adjusted using manual operation.

CAUTION

To be assured of uniform pressure, it is necessary to adjust the DOWN STOP Adjustment Screw (14) when in the HOLD-WELD position.

f. In the HOLD-WELD position, the clamping force is applied to the weld junction with the foot switch at the first position. To make a weld, the foot switch must be depressed to the second position.

g. In the PRESSURE-SENSING position, the clamping force and weld are simultaneous when the foot switch is depressed to the first position.

SECTION III. OPERATION

GENERAL.

A description of the operation of the Module Weld Head, VTA-60, is contained within this section. Reference is made to figures 4-1 through 4-3 for supporting information.

ACTUATING CABLE ASSEMBLY.

The Actuating Cable Assembly (46), figure 4-1, consists of a plastic covered stranded cable which is attached via a loop to the Operating Lever Assembly (17) and via a chain to the foot pedal. Application of mechanical pressure to the foot pedal causes tension to be applied to the interconnected chain and Actuating Cable Assembly. As the foot pedal proceeds downward, the interconnected chain and Actuating Cable Assembly also begin downward travel. The Actuating Cable Assembly transfers the downward motion to the Operating Lever Assembly.

OPERATING LEVER ASSEMBLY.

The Operating Lever Assembly (17), figure 4-1, consists of two formed arms retained in parallel with two nuts and bolts, and a spacer. The Actuating Cable Assembly (46) is connected to the Operating Lever Assembly at the force application point. The opposite end of the Operating Lever Assembly is attached to the Frame Assembly with a pin which permits free movement of the lever thus forming a fulcrum. The direction of movement is along a vertical axis. The Link Assembly (50) is mounted between the arms forming the Operating Lever Assembly which is the work operating point. The Link Assembly is also mounted to permit free movement.

Tension applied to the Actuating Cable Assembly (46) is transferred to the Operating Lever Assembly (17) causing it to follow the foot pedal in a downward direction. As the point of force application on the Operating Lever Assembly begins its travel in a downward direction, the Link Assembly also begins to travel downward because it is located at a work operating point which is between the fulcrum and the point of force application.

PRESSURE BARREL ASSEMBLY.

The Pressure Barrel Assembly (8), figures 4-1 and 4-2, consists of a pressure barrel (8), FORCE Adjustment Knob (12), pressure adjusting nut (109) and screw (9), two springs (111) and (117), flatwashers (116) and (119) and a steel pin (86). The Pressure Barrel Assembly (8) is mounted within the span of the "U" shaped Link Assembly (50) with a steel pin (86). Any downward motion of the Link Assembly (50) as a result of movement of the Operating Lever Assembly (17) is transferred to the Pressure Barrel Assembly (8) through the steel pin (86). Consequently the Pressure Barrel Assembly (8) begins to travel in a downward direction as mechanical pressure is applied to the foot pedal.

YOKE ASSEMBLY.

The Yoke Assembly (103), figure 4-1, consists of a machined aluminum yoke tapped to receive a socket head cap screw to provide clamping pressure. The Yoke Assembly (103) is clamped to the Ram Assembly (81). The Yoke Assembly (103) is provided with two bearings (102), one each being mounted on the left and right sides of the yoke (103). The bearings (102) are

caused to run along guide rods (6) which are mounted within the frame (4). The use of bearings with guide rods (6) restricts the occurence of horizontal movement during Ram Assembly (81) travel when the Yoke Assembly is clamped tight. The Yoke Assembly (103) has a projection on the rear side which is inserted through a vertical oversize groove into the pressure barrel (8). The projection supports the upper spring within the pressure barrel (8) and rests on a flat washer supported by the lower spring within the pressure barrel. Downward movement of the Pressure Barrel Assembly (8) causes the internally mounted upper spring to exert pressure on the yoke projection (103). The Yoke Assembly (103) is caused to move downward as the pressure of the upper spring overcomes the inertia of the Yoke and Ram Assemblies (103 and 81).

RAM ASSEMBLY.

The Ram Assembly (81), figure 4-1, consists of ram (81), ram sleeve (78), and a jumper tab (55). The ram (81) is vertically mounted in the frame (4). Precision vertical movement of the ram (81) is obtained by the use of precision ball bushings which are pressed into the frame jacketing the interior of the mounting hole. The ram sleeve (78) is pressed on the lower end of the ram (81) and the jumper tab (55) is clamped on the ram sleeve (78). The laminations of the Jumper Assembly (100) are attached to the jumper tab (55). The Ram Assembly moves downward as a result of the downward movement of the Yoke Assembly which is clamped to the ram (81).

ELECTRODE HOLDER ASSEMBLIES.

The Electrode Holder Assemblies, figure 4-1, consists of an electrode arm, a collar, and

an electrode arm holder. The electrode arm holder (77) is clamped to the ram sleeve (78) and the collar (75) and electrode arm (73) are clamped to the electrode arm holder (77) thereby forming the upper electrode holder. The lower electrode arm holder (59) is clamped to shaft (61) inserted into the keyed hole within the cast aluminum base assembly. Since the upper electrode arm holder (77) is clamped to the Ram Assembly (81), any downward movement of the ram (81) causes the upper electrode holder to follow. The downward movement of the upper electrode holder continues until any materials inserted between the electrodes are contacted.

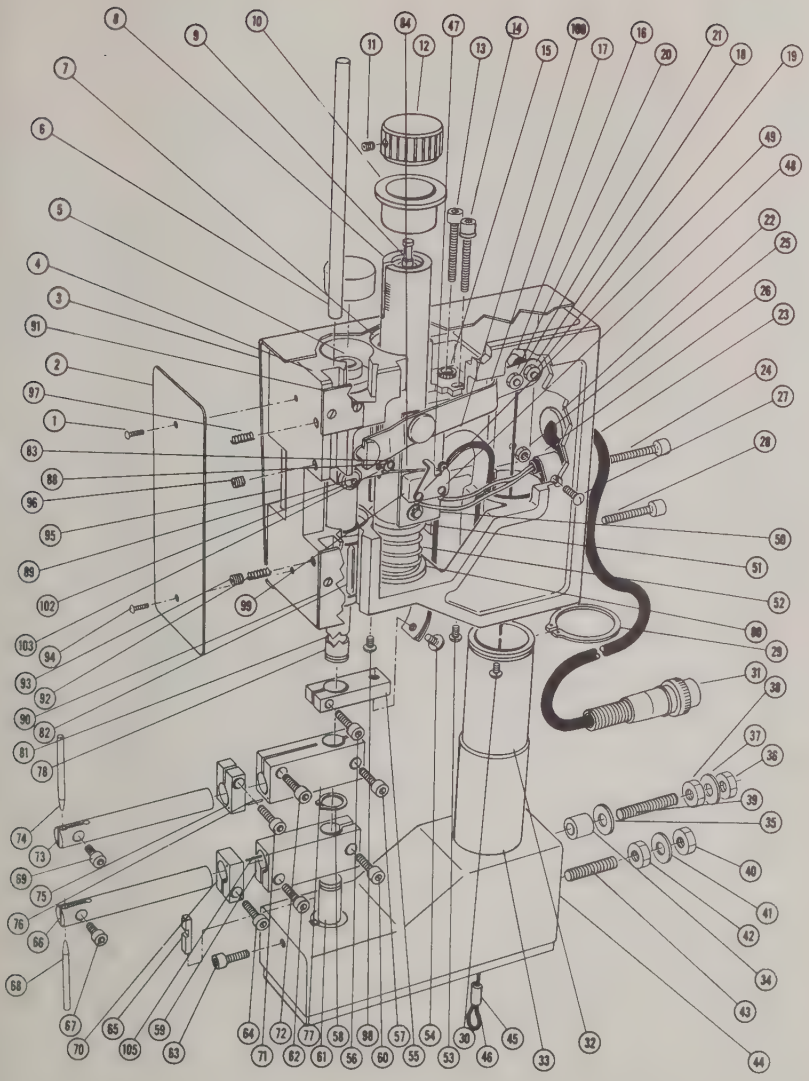
FIRING SWITCH ASSEMBLY.

The Firing Switch Assembly (99), figure 4-1, consists of a micro-switch (99), plate (47), and lever (84). The portion of the lever (84) which contacts the micro-switch button is flattened in order to insure reliability of operation. The downward movement of the upper electrode holder continues until any materials inserted between the electrodes are contacted. As the Pressure Barrel (8) continues to move downward, more pressure is applied to the upper spring mounted within the pressure barrel which in turn is applied through the yoke projection to the ram (81). The movement of the ram (81) is restricted because contact with the materials to be welded has been made by the upper electrode holder. The movement of the Pressure Barrel Assembly (8) continues as increased pressure is applied to the foot pedal. In turn, the electrode pressure or weld force continues to increase. As the upper spring (111) within the pressure barrel (8) gives way to the projection on the yoke (103), the pressure barrel (8) continues its downward movement while the ram (81) and upper electrode

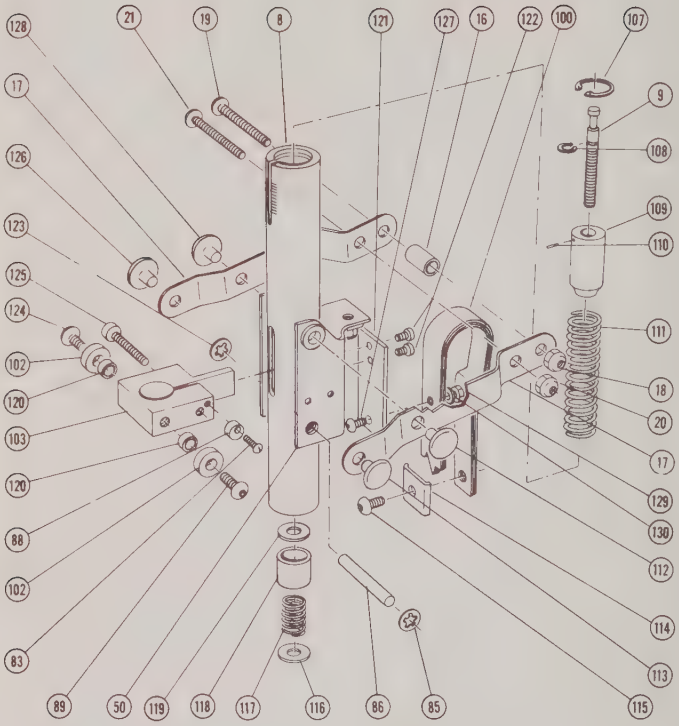
holder remain at rest at the preselected electrode pressure. The cam (88) mounted on the side of the yoke (103) does not follow the movement of the micro-switch lever and consequently is not able to continue holding the firing switch (99) in the open position. With pressure reduced on the micro-switch lever (84), the firing switch (99) is closed and the weld head discharges. At this time the pressure on the foot pedal may be released in order that another cycle may be performed.

AIR ACTUATOR ASSEMBLY.

The Air Actuator Assembly, figure 4-3, consists of a flow valve (155), a solenoid valve (158), an actuating cylinder (170), a mode selection switch (143), a line fuse (137) and a foot switch. Filtered air from an appropriate air pressure source is applied to the solenoid valve (158) via the flow valve (155). The solenoid valve (158), when actuated by the foot switch, causes the air charge within the valve to be applied to the actuating cylinder (170) causing it to function. The actuating cylinder piston rod (164) is connected via a short length of cable to the Operating Lever Assembly. The short length of cable is pulled by the actuating cylinder piston rod (164) when actuated by the solenoid valve (158) and causes the force to be transferred to the Operating Lever Assembly. Refer to paragraph 3-4 for Operating Lever Assembly sequence of operation.



VTA-60 Fig. 4 - 1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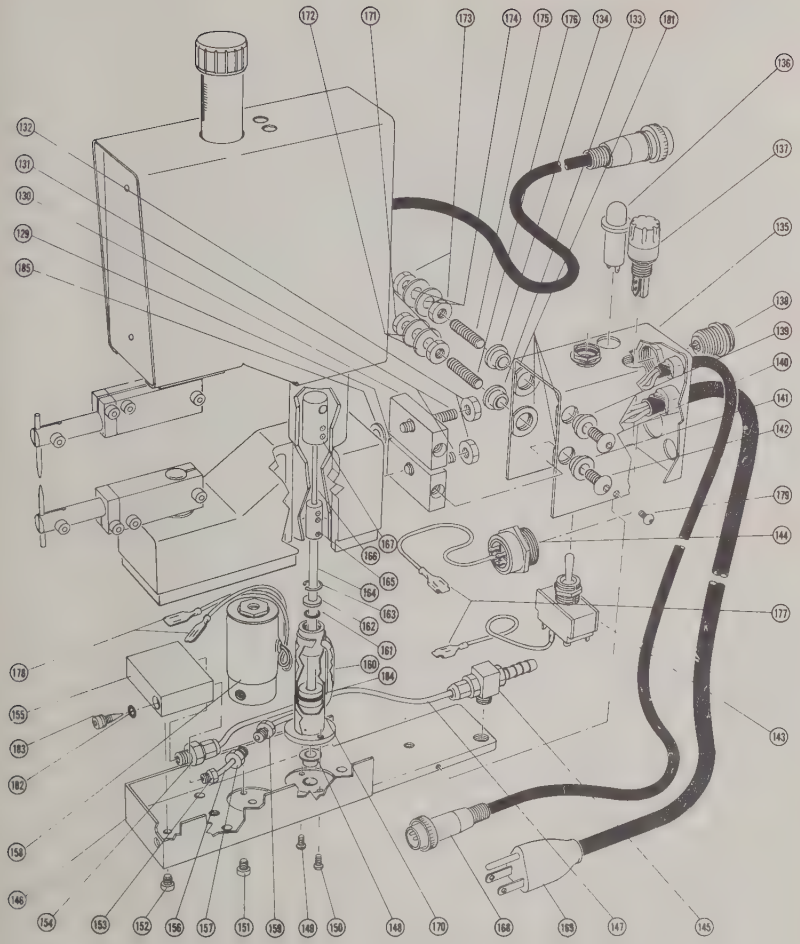
VTA-60 Fig. 4 - 2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VTA-61 Fig. 4 - 3

SECTION IV

MAINTENANCE

4-1. GENERAL. The maintenance procedures covering the Module Weld Head, VTA-60, are contained within this section. Reference is made to figures 4-1 through 4-3 for supporting information.

4-2. DISASSEMBLY..

4-3. The Module Weld Head, VTA-60, is disassembled as follows:

a. Remove screw (11). (See figure 4-1)

b. Remove FORCE Adjustment Knob (12)

c. Remove screws (30 & 98) from the left and right sides of Weld Head which retain the case (3) to the frame (4).

d. Grasp the case (3), spread bottom of case.

e. Lift case (3) vertically and remove from the weld head.

f. Remove screws (1 & 94) retaining face plate (2) to frame (4).

g. Remove face plate(2).

h. (See Assembly and Adjustment Note).

i. Remove screws (48 & 49) retaining micro-switch (99).

j. Loosen screw (27) to permit free movement or switch cord (23).

k. Gently tap gromett (22) out of frame (4) from inside of frame.

l. Pass switch cord (3) with micro-switch (99) attached, out through hole in frame.

m. Loosen electrode ARM HOLDER SWIVEL screw (57).

n. Remove Upper Electrode Holder Assembly from ram sleeve(78).

o. Loosen ELECTRODE ARM Screw (69) and remove electrode.

p. Loosen ELECTRODE ARM CLAMP Screw (72) and remove electrode arm (73) and collar (75).

q. Loosen COLLAR Screw (71) and remove electrode arm.

r. Loosen ELECTRODE ARM HOLDER Swivel Screw (60).

s. Remove Lower Electrode Holder Assembly from shaft (61).

t. Loosen ELECTRODE ARM Screw (67) and remove electrode.

u. Loosen ELECTRODE ARM CLAMP Screw (62) and remove electrode arm (66) and collar (70).

v. Loosen COLLAR SCREW (64) and remove electrode arm.

w. Place the UP STOP adjustment in the extreme UP position by rotating the UP STOP Adjustment Screw (13) in a counter clockwise direction.

x. Remove nut (20) and bolt (21).

y. Remove nut (18), bolt (19), spacer (16) and Actuating Cable Assembly (46).

z. Remove lever arms (17) from left and right side of the frame (4).

AA. Remove screws (122) retaining jumper support (121) to link assy. (50).

BB. Remove screw (54).

CC. Remove retaining ring (107). (See figure 4-2)

DD. Remove retaining ring (108).

EE. Remove force adjusting nut (109) and screw (9).

FF. Remove spring (111).

GG. Remove screws (93 & 96). (See figure 4-1).

HH. Slide guide rod (6) vertically out of mounting hole taking care not to loose springs (92 & 97).

II. Remove screws (89) cam spacer (120) and bearings (102).

NOTE: Before proceeding to JJ. Note location of yoke (103) on RAM ASSY. (81) to insure PROPER REASSEMBLY.

JJ. Loosen screw (125) thereby unclamping yoke (103).

KK. Loosen HEAD, HORIZONTAL Adjustment Screws (24 & 28) and swing the weld head 90 degrees from full front, either side of base, and remove RAM ASSEMBLY (81) from bottom of frame (4).

LL. Grasp the yoke (103) with one hand and grasp the pressure barrel (8) with the other and rotate both together 1/4 turn in the counter clockwise direction.

MM. Remove yoke (103) from pressure barrel (8).

NN. Remove retaining ring (85).

OO. Remove pin (86) taking care not to loosen spring (117) and flat washers (116 & 119). (See figure 4-2).

PP. Remove Link Assembly (50) and pressure barrel (8). (See figure 4-1)

QQ. Remove snap ring (29).

RR. Remove frame (4) from column.

CAUTION

Disassembly beyond that given in the steps above is not recommended. Further disassembly would require the use of specialized tools and knowledge which is available at the manufacturing facility.
In the event problems encountered dictate further disassembly, it is recommended that the instrument be shipped intact to the factory, Vacuum Tube Products, Division of Hughes Aircraft Company, Oceanside, California. Here factory engineers and technicians will evaluate the problem and contact your company for further instructions regarding repair.

NOTE

Assembly is the reverse order of disassembly, except the replacement of parts 89, 120, and 102 Section 4-3 line II. Parts (89), (120) and (102) are replaced at line H, Section 4-3, using the Following Procedure.

1. Back screws (93 & 96) out far enough to let Guide Rod (6) lay against the front of slot.

2. Assemble Parts (89), (120) and (102) to Yoke (103). Tighten screws (89) very lightly.

3. Turn screws (93 & 96) in until they contact Guide Rod (6).

4. Turn screws (93 & 96) one half turn or until Guide Rod (6) is .015 in., TOP & BOTTOM from the front of casting.

5. Adjust Cam Spacers (120) until both Bearings (102) just touch the Guide Rods (6). Tighten screws (89).

6. Position UP STOP Screw (13) and DOWN STOP Screw (14) at maximum, To allow full TRAVEL OF RAM.

7. Set Force Adjust Screw (9) so Adjust nut indicates zero on scale.

8. Acutate Lever Assy. (17) through Full Stroke while moving UPPER ELECTRODE CLAMP (77) from side to side To Determine The Area of greatest Movement.

9. Adjust screws (93 & 96) Alternately Begining in THE AREA OF GREATEST MOVEMENT, UNTIL ALL SIDE MOTION IS REMOVED.

10. Continue to Actuate Lever (17) through the full TRAVEL WHILE ADJUSTING SCREWS (93 & 96). until a uniform BEARING LOAD IS FELT THROUGH THE FULL TRAVEL OF THE RAM ASSY. (81).

11. Adjust Guide Rod (6) Only Enough To Remove Side Movement.

CAUTION:

DO NOT PRELOAD BEARINGS. This will cause uneven movement of Ram, as well as shorten BEARING LIFE.

4-4. The Air Operated Module Weld Head VTA-61, is disassembled as follows:

a. Disconnect the foot switch cable from the rear of the Air Actuator Assembly.

b. Disconnect the weld head switch cord from the rear of the Air Actuator Assembly.

c Disconnect air pressure input tubing from the rear of the Air Actuator Assembly.

d. Remove the two 1/4-20 hold-down bolts retaining the VTA-61 to the workbench.

e. Remove screw (11). (See figure 4-1)

f. Remove FORCE Adjustment Knob (12).

g. Remove screws (30 & 98) from the left and right sides which retain the case (3) to the frame (4).

h. Grasp the case (3) at the bottom, left hand on left side and right hand on right side, and pull gently apart increasing the

span of the case until the flanges on the underside clear the frame (4).

i. Lift case (3) vertically and remove from the weld head.

j. Remove nut (18), bolt (19), spacer (16) and actuating cable.

k. Remove nuts (171), washers (172), nuts (173), washers (174) and insulating washers (134 & 133). (See figure 4-3)

l. Remove screws (140 & 142) and insulating washers (139 & 141).

m. Remove studs (175 & 176), and screws 179 & 180).

n. Partially remove case (by) lifting vertically and then toward the rear for 1-1/2 inches only.

o. Disconnect solderless connectors (177 & 178) and remove case (135).

CAUTION:

Proceed with CAUTION during the performance of the following procedure to prevent unnecessary damage to the instrument.

p. Lift the weld head vertically from the base (146) of the Air Actuator Assembly.

q. Remove screws (149, 150, 151 & 152) and remove the flow control valve (155)

actuating cylinder (170) and solenoid valve (158) from base (146) as a complete assembly.

r. The disassembly of the weld head is identical to that of the Module Weld Head, VTA-60, as presented in the previous paragraph.

NOTE

Assembly is the reverse order of disassembly.

4-5. CLEANING AND INSPECTION PROCEDURES

WARNING

Exercise extreme caution when utilizing methyl alcohol during the performance of the following procedures. Use the cleaning solvent in a well ventilated area and away from open flame.

4-6. CLEANING NUTS, BOLTS, WASHERS, AND OTHER SMALL PARTS.

a. Place a small quantity of cleaning solvent, methyl alcohol, in a small container having a relatively large mouth.

b. Place all nuts, bolts, washers, and other small metallic parts within the solution.

c. Swish and wash the parts within the solution.

d. Remove the parts from the solution and dry with a clean, lint-free, cloth.

e. Blow the parts with a low pressure dry air source to remove any remaining foreign particles.

4-7. CLEANING ANODIZED ALUMINUM, STEEL, AND BRASS PARTS.

a. Dampen a clean, lint-free, cloth with cleaning solvent, methyl alcohol.

b. Wipe all anodized aluminum, steel, and brass parts.

c. Blow the parts with a low pressure dry air source to remove any remaining foreign particles.

4-8. CLEANING GOLD PLATED PARTS.

a. Dampen a clean, lint-free, cloth with cleaning solvent, methyl alcohol.

b. Wipe all gold plated parts.

c. Blow the parts with a low pressure dry air source to remove any remaining foreign particles.

4-9. THREAD INSPECTION. Inspect threads of various components for nicks, burrs, and signs of cross-threading.

4-10. METAL PARTS INSPECTION. Inspect metal parts for nicks, cuts, and breaks.

4-11. REPAIR AND REPLACEMENT.

4-12. Replace all worn or damaged parts.

4-13. LUBRICATION PROCEDURES.

4-14. OPERATING LEVER ASSEMBLY LUBRICATION. Lubricate the Operating Lever Assembly as follows:

WARNING

Use a high grade, light duty machine oil during the performance of the

following procedure. Insure that only the indicated amount of oil is used, otherwise, optimum operation of the instrument cannot be expected.

a. Place one (1) drop of oil at the operating point and fulcrum of each arm of the Operating Lever Assembly (17).

4-15. AIR ACTUATOR ASSEMBLY LUBRICATION. Lubricate the Air Actuator Assembly as follows:

a. Permanently install an air line lubricator at the air source input of the Air Actuator Assembly.

b. Turn the air line lubricator ON for 1/2 hour intervals every 20 hours of Air Actuator Operation.

4-16. TROUBLE SHOOTING PROCEDURES.

4-17. VISUAL INSPECTION. Malfunctions within the Module Weld Head, VTA-60, may be caused by defects that are easy to see. A brief list of such defects follow. Check as many of these as may apply to the trouble shooting problem prior to using more involved procedures.

a. Worn or broken wires.

b. Improperly secured components.

c. Loose connections.

d. Broken components.

e. Cracked components.

f. Worn components.

4-19. Table 4-1 presents a generalized procedure which will aid maintenance personnel in performing the trouble shooting.

Table 4-1. Trouble Analysis

Table 4-1. TROUBLE ANALYSIS

TROUBLE	PROBABLE CAUSE	REMEDY
1. No welding current	a. DOWN STOP Adjustment Screw (14) improperly adjusted. (See figure 4-1)	a. Refer to paragraph 2 Page 19.
	b. Incorrect operating procedure. Foot pedal must be depressed sufficiently to close firing switch (99)	b. Refer to Paragraph 2-3 Page 15.
	c. Power not supplied to weld head.	c. Refer to paragraph 2-3, Pg.
	d. Power supply malfunctioning	d. Refer to power supply manufacturer's maintenance literature
	e. FORCE Adjustment Knob (12) improperly adjusted	e. Readjust FORCE Adjustment Knob (12)
	f. Broken connection at firing switch (99)	f. Repair broken connection
	g. Firing switch lever (84) improperly adjusted	g. Adjust firing switch lever (84)
	h. Faulty firing switch (99)	h. Replace faulty firing switch (99)
2. Lack of weld although welding current is available	a. Dirty, worn, or corroded electrodes	a. Replace electrodes.
	b. Power cable connections loose	b. Tighten nut on cable attachments to prevent

Table 4-1 Trouble Analysis (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
		arcing and loss of power
	c. Damaged insulation on upper weld cable connector to base of head	c. Examine insulation on weld cable and replace cable if necessary
	d. Malfunction power supply	d. Refer to power supply manufacturer's maintenance literature
	e. Head, Horizontal Adjustment screws (24 & 28) are loose	e. Tighten Head, Horizontal Adjustment Screws (24 & 28)
3. Binding or restricted movement of upper electrode holder	a. FORCE Adjustment Knob (12) improperly adjusted	a. Readjust FORCE Adjustment Knob (12)
	b. Anti-rotation guide rod (6) improperly adjusted	b. Adjust anti-rotation guide rod (6)
4. Evidence of wiping action at weld juncture	a. Loose or damaged upper or lower Electrode Holder Assemblies	a. Tighten or replace loose or damaged Electrode Holder Assembly
	b. Anti-rotation guide rod (6) improperly adjusted	b. Adjust anti-rotation guide rod (6)

Table 4-1. Trouble Analysis (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
	c. Faulty job setup	c. Examine jig or fixtures holding job in work position Tighten as required to prevent movement of material
	d. Worn ball bushings (82) in frame (4)	d. Contact engineering personel of Vacuum Tube Products Division of Hughes Aircraft Corp., Oceanside, Calif., for further instructions.
5. Minimum electrode force not obtainable	a. Actuator (84) bent	a. Realign actuator (84) to close firing switch (99) with 1/16 inch upward movement of the upper Electrode Holder Assembly
	b. Anti-rotation guide rod (6) improperly adjusted	b. Adjust anti-rotation guide rod (6)
	c. Dirty ball bushings (82) in frame (4) (See figure 4-1)	c. Clean ball bushings (82)
	d. Firing switch lever (84) improperly adjusted	d. Adjust firing switch (84)

FIGURE 4-1 INDEX NO.	PART NO.	NOMENCLATURE
-1	WD1531-2	Screw
-2	WD1563-2	Face Plate
-3	WD1564	Case
-4	WD1531	Frame
-5	WD1554	Ram
-6	WD1537-P-1	Guide Rod
-7		Eastman 910 Cement
-8	WD1565	Pressure Barrel
-9	WD1569	Pressure Adjust Screw
-10	WD1538-2	Upper Barrel Bushing
-11	WD1531-37	Socket Set Screw
-12	WD1562	Pressure Adjust Knob
-13	WD1535-12	Socket Cap Screw
-14	WD1531-16	Down Stop Screw Assy
-15	WD1535-2	Splined, Self Lock Nut
-16	WD1531-18	Fiber Spacer
-17	WD1566	Operating Lever Assy
-18	WD1531-22	Nut, Self Lock
-19	WD1531	Screw

FIGURE 4-1 INDEX NO.	PART NO.	NOMENCLATURE
-20	WD1531-22	Nut, Self Lock
-21	WD1531-20	Screw
-22	WD1707	Grommet
-23	WD1575	Switch Cord
-24	WD1535-12	Socket Cap Screw
-25	WD1531-36	Nut
-26	WD1561-4	Cable Clamp
-27	WD1531-26	Screw
-28	WD1535-12	Socket Cap Screw
-29	WD1531-14	Retaining Ring
-30	WD1535-14	Button Head Screw, Gold Plate
-31	WD1561-6	Male Cable Plug
-32	WD1542	Column Assy
-33	WD1542-1	Column Insulator
-34	WD1571	Insulator
-35	WD1540-6	Fiber Washer
-36	WD1540-2	Jam Nut-Brass
-37	WD1540-8	Washer-Brass
-38	WD1540-2	Jam Nut-Brass

FIGURE 4-1 INDEX NO.	PART NO.	NOMENCLATURE
-39	WD1573-4	Stud-Brass
-40	WD1540-2	Jam Nut-Brass
-41	WD1540-8	Washer-Brass
-42	WD1540-2	Jam Nut-Brass
-43	WD1573-2	Stud-Brass
-44	WD1541	Base
-45	WD1570-4	Nicopress Sleeve
-46	WD1570	Actuating Cable Assy
-47	WD1531-10	Micro-switch Actuator Assy (JS-21)
-48	WD1531-12	Screw-Nylon
-49	WD1531-12	Screw-Nylon
-50	WD1558	Link Assy
-51	WD1700	Spring Spacer
-52	WD1539-4	Spring
-53	WD1535-14	Button Head Screw Gold Plate
-54	WD1531-35	Button Head Screw Gold Plate
-55	WD1557	Jumper Tab
-56	WD1797	Socket Cap Screw, Special

FIGURE 4-1 INDEX NO.	PART NO.	NOMENCLATURE
-57	WD1544-4	Socket Cap Screw
-58	WD1531-4	Retaining Ring
-59	WD1546-3	Lower Clamp
-60	WD1544-4	Socket Cap Screw
-61	WD1543	Post
-62	WD1544-4	Socket Cap Screw
-63	WD1540-4	Socket Cap Screw
-64	WD1544-4	Socket Cap Screw
-65	WD1574	Key
-66	WD1545	Horn
-67	WD1544-6	Socket Cap Screw
-68	EH-125-02	Electrode
-69	WD1544-6	Socket Cap Screw
-70	WD1547	Lower Collar
-71	WD1544-4	Socket Cap Screw
-72	WD1544-4	Socket Cap Screw
-73	WD1545	Horn
-74	EH-125-02	Electrode
-75	WD1547	Upper Collar

FIGURE 4-1 INDEX NO.	PART NO.	NOMENCLATURE
-76	WD1572-4	Roll Pin (ESNA-52-012-0437)
-77	WD1546-2	Upper Clamp
-78	WD1556	Sleeve
-79		
-80	WD1538-4	Bushing
-81	WD1553	Ram Assy
-82	WD1535-6	Ball Bushing, Upper and Lower. Thomson Industries No. A-81420
-83	WD1548-4	Screw
-84	WD1531-10	Micro-switch Actuator Arm (JS-21)
-85	WD1706-8	Retaining Ring
-86	WD1706	Pin
-87		
-88	WD1550	Cam
-89	1548-8	Screw
-90	WD1786-P2	Anti-rotation Cover Plate
-91	WD1786-P1	Anti-rotation Cover Plate

FIGURE 4-1 INDEX NO.	PART NO.	NOMENCLATURE
-92	WD1539-12	Spring
-93	WD1535-8	Adjusting Set Screw
-94	WD1531-2	Screw
-95	WD1537-P2	Guide Rod
-96	WD1535-8	Adjusting Set Screw
-97	WD1539-12	Spring
-98	WD1535-14	Button Head Screw Gold Plate
-99	WD1561-2	Micro-switch (1SM1)
-100	WD1560	Jumper Assy
-101	WD1535-10	Bushing
-102	WD1548-6	Bearing, MPB (6632)
-103	WD1549	Yoke
-104	WD1796	Ram Dust Cap
-105	WD1572-4	Roll Pin (ESNA-52-012-062-0437)
-106		
-107	WD1531-28	Retaining Ring
-108	WD1531-38	"E" Ring
-109	WD1568	Pressure Adjust Nut

FIGURE 4-1 INDEX NO.	PART NO.	NOMENCLATURE
-110	WD1568-2	Spiral Pin
-111	WD1539-6	Spring
-112	WD1566-2	Projection Weld Pin
-113	WD1566-2	Projection Weld Pin
-114	WD1696	Strap Lug
-115	WD1531-35	Button Head Screw Gold Plate
-116	WD1531-30	Washer
-117	WD1539-8	Spring
-118	WD1555	Pressure Barrel Spacer
-119	WD1531-30	Washer
-120	WD1736	Bearing Support Cam
-121	WD1746	Jumper Support
-122	WD1531-32	Screws, Pan Head, Nylon
-123	WD1706-8	Retaining Ring
-124	WD1548-8	Screw
-125	WD1548-2	Socket Cap Screw
-126	WD1566-2	Projection Weld Pin
-127	WD1531-31	Button Head Screw

FIGURE 4-1 INDEX NO.	PART NO.	NOMENCLATURE
-128	WD1566-2	Projection Weld Pin
-129	WD1531-34	Washer, Flat, Brass
-130	WD1531-33	Nut, Hex, Brass

FIGURE 4-3 INDEX NO.	PART NO.	NOMENCLATURE
-131	WD1662	Terminal Block
-132	WD1662	Terminal Block
-133	WD1743	Spacer-Bushing
-134	WD1743	Spacer-Bushing
-135	WD1657	Cover
-136	WD1744-11	Lamp-Omni-Glo #1040A75
-137	WD1744-12	Fuse Holder
-138	WD1744-9	Connector-Amphenol #80-PC-2F
-139	WD1743	Spacer Bushing
-140	WD1744-16	Button Head Screw
-141	WD1743	Spacer Bushing
-142	WD1744-16	Button Head Screw
-143	WD1744-10	Switch-JBT-ST52P
-144	WD1744-8	Connector-Amphenol 91-PC-4F
-145	WD1691	Air Inlet Block
-146	WD1704	Base
-147	WD1713	Air Line
-148	WD1711-11	Piston Bumper

FIGURE 4-3 INDEX NO.	PART NO.	NOMENCLATURE
-149	WD1711-2	Screw
-150	WD1711-2	Screw
-151	WD1711-3	Socket Cap Screw
-152	WD1711-3	Socket Cap Screw
-153	WD1701	Tube Fitting, Special
-154	WD1716	Tube Fitting 1/8 Tube to 1/8" PT
-155	WD1651	Air Flow Valve
-156	WD1702	Flow Valve Air Line Assy
-157	WD1524	Dryseal Tube Fitting 1/16" Pipe Thread
-158	WD1660	Solenoid Valve, Skinner, Modified
-159	WD1524	Dryseal Tube Fitting 1/16" Pipe Thread
-160	WD1711-4	Insulator
-161	WD1711-6	"O" Ring, 5/16 O.D. x 3/16 I.D.
-162	WD1693	Piston Rod Seal Retainer
-163	WD1711-5	Retaining Ring
-164	WD1663	Piston Rod

FIGURE 4-3 INDEX NO.	PART NO.	NOMENCLATURE
-165	WD1710	Cable Coupling
-166		Cable, 3/64 x 7 x 7 Steel, Nylon Cover
-167	WD1709	Cable Coupling
-168	WD1512	Firing Circuit Cable Assy
-169	WD1744-13	Cable Set, SJT-#18, Vinyl Jacket
-170	WD1695	Cylinder Assy
-171	WD1540-2	Jam Nut-Hex-Brass
-172	WD1540-8	Washer, Flat, Brass, #14
-173	WD1540-2	Jam Nut-Hex-Brass
-174	WD1540-8	Washer, Flat, Brass, #14
-175	WD1573-2	Stud, Brass
-176	WD1573-2	Stud, Brass
-177	WD1744-18	Female Spade Lug
-178	WD1711-12	Male Spade Lug
-179	WD1744-17	Button Head Screw
-180		
-181	WD1742	Insulating Washer

FIGURE 4-3 INDEX NO.	PART NO.	NOMENCLATURE
-182	WD1711-10	"O" Ring, Linar, Mil-Spec-AN6227B-3
-183	WD1514	Air Flow Valve Stem
-184	WD1711-7	"O" Ring, 1/2" O.D. x 3/8" I.D.
-185	780-P-012	Insulating Washer
-186	WD1686	Electrode Table VTA 64
-187	WD1692	Actuator Yoke VTA 64